

review not merely of all terrestrial space but of all terrestrial time as well, we are carried back "over an incalculable number of thousands of years" to the prehistoric time of crude tools of flint, bone, horn, and the like, and so by rapid strides through stone and bronze and iron to these last days, on which the age of steel is dawning.

This, however, is only by way of prelude, and the author straightway settles down to his facts and figures. These latter are naturally so numerous that the general reader will hardly find the book as a whole a light or entertaining one; yet apart from the very high value of the statistics for purposes of reference, there is much in the book to interest every one who cares for his country's or the world's welfare.

First, a few words with respect to the character of the statistics. These of course vary in completeness and in accuracy with the respective development or otherwise of the countries concerned, or of these special industries. With respect to our own country tabular statements are given of the number of pits for certain years between 1854 and 1876; of the production in each coal-district for the year last named; of the total produce in each year since 1854 as well as for certain years previously; of the percentage of increase in production and in value; of the chemical constituents of all the more important coals (sixteen in number); of the comparative heating power and general utility of certain English and Westphalian steam-coals used by the German navy; of the average price of coal for each year from 1865 and for certain years before; of the chief purposes to which the coal is applied and in what proportions; of the growth of British railways, and of the coal traffic thereon as well as by sea and canal; of the growth of British shipping; of the coal exports, and of the chief countries importing these, with the weight and value of their respective amounts. Add to these similar tables for the iron and steel industries of Great Britain; and multiply the total by a similar number of tables according to their degree for other great coal and iron producers such as Germany, United States, Belgium, and France; add also every available form of statistics for other parts of the globe, from the Arctic Circle to the Cape of Good Hope, and from Japan to Morocco, and one will readily admit that as a book of reference the work must be invaluable.

But the book is no mere statistical abstract. These tables, numerous as they are, are only scattered here and there throughout a very full and valuable text. The history of the rise and development of the great coal and iron industries here and elsewhere is stated briefly but sufficiently: the relative advantages and disadvantages of the several competing countries in their material and social aspects are well indicated: such questions as those of labour, increased or improved means of transport, the near prospects of such inventions as the Siemens-Martin and Bessemer steel processes, Barff's process for preventing iron from rusting, electric lighting, &c., are also discussed; and finally, the *literature* of the subjects dealt with is shown under each head at length, so that those whose special requirements demand more than even this work can give them, are at least shown where they may find the information they desire.

At a time of such profound depression in both these important industries, one naturally is eager to discover

any rift among the clouds which the large accumulation of facts here contained, or the conclusions of so wide and an accurate an observer, may disclose. There is doubtless a consolation of a selfish kind to be got from observing that the state of affairs as to depreciation in the value of collieries and ironworks, in the prices of iron and coal, and in the wages of the workmen, is apparently quite as bad among our competitors as among ourselves. Thus the average price of coal in Germany was, in 1873, 10s. 9d., and in 1877, 5s. 7d.; the wages, after rapidly rising, have now fallen back to the rates prevalent ten years ago, while the character of the workmen has deteriorated, and their relations to their employers have been changed in every way for the worse. In the iron trade the 125 joint-stock companies lost in 1877 alone a sum equal to 8.9 per cent. of their aggregate capital, which amounts to £24,335,709; and this capital at present represents, according to the quotation of the Berlin share-market, a current value of about £7,335,000 only. One regrets to notice that M. Pechar's chief remedy for these evils appears to be a return to protective tariffs so far as they have been abolished, and an aggravation of them where they exist. He is profoundly convinced that for many years to come no country in the world can hope to compete in the world's markets or even in their respective home-markets, with Great Britain in any but minor special products.

M. Pechar, however, has good hopes for the iron industry generally and consequently for the coal industry, whose fortunes depend so closely on those of iron. He expects that in most of the *present* applications of iron, steel will shortly supplant it, but that the iron industry will not therefore perish, but on the contrary will find new and larger spheres, partly as subsidiary to steel, partly by in its turn ousting wood and other substances from many of their present uses, as for example in buildings.

But it is unfair to summarise M. Pechar's conclusions apart from the many considerations by which he supports them, and we must therefore refer the reader on this and other points to the book itself. It will amply repay his perusal.

J. MARSHALL

OUR BOOK SHELF

Natural History, Sport, and Travel. By Edward Lockwood. (London: Allen and Co., 1878.)

MONGHYR is a large district in Bengal, divided into two nearly equal portions by the Ganges. Here Mr. Lockwood has spent many years as magistrate, and during that period had the inclination and the capacity to gather much knowledge of the district and its people. He laments in his preface that during twenty years' service he met only one Englishman (a Professor of Botany) who could identify the most common trees and plants. This is certainly lamentable, especially for the ignorant themselves, who thus miss a great and constant source of enjoyment and a fine opportunity of adding to a knowledge of the productions of one of our most important dependencies. This modest little volume is a good example of what may be done by a man who makes no pretensions to have more than a "desultory" knowledge of natural history. Mr. Lockwood is a very good observer, and his book contains many valuable notes on the animals and plants to be met with in the district of Monghyr. He has much

also to tell us about the people and their mode of life, the places of interest in the district, sporting experiences, and the various kinds of culture carried on. Altogether his volume is interesting and a distinct addition to our knowledge of the district over which its author ruled.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Weather, Past and to Come

SIMULTANEOUSLY with the appearance of some important remarks by Mr. Hyde Clarke, in the article "Sun-Spots and the Nile," NATURE, vol. xix, p. 300, I have been called up by a London clergyman of inquiring mind to answer the charge that a paragraph which he cut out of the *Times* last year, declaring on my alleged authority that that winter was to be severer in cold than any known for generations had been totally falsified by the event. I would request, therefore, Mr. Editor, a little space in your valuable pages for the following explanations:—

I give priority to Mr. Hyde Clarke, on account of his early labours in demonstrating a periodicity in human affairs, somewhat of the type of the sun-spot period subsequently discovered elsewhere. His remarks, too, now, of the probability of the existence of other periods of about 26 and 104 years, and that they "interfere," or mix up, with what he considers a ten-year period, are also worthy of note. In fact, they are the first public consent I have yet seen to my often insisted on conclusion from the Edinburgh earth thermometers, that the explanation of the eleven-year wave of heat exhibited there, being both immediately preceded and immediately followed by the deepest trough or wave of cold, for each whole eleven-year cycle on either side of it, was precisely caused by the near concurrence just there of two sets of waves of different periods of undulation. But when he goes on to say (line 38, p. 300) that such interference of two or more sets of undulations "prevented any absolute calculation as to the future," I object to the ruling of that sentence.

The complication may make the matter more difficult. It may oblige the State at last to set apart some good men for professionally prosecuting that subject, and to put them into a dungeon if they attend to anything else. But that is all! Two or three, even six or seven planets, pulling away at the earth and the earth at them in periods of different lengths and with different degrees of energy, do not prevent physical astronomers predicting the final outcome of it all on the earth's motion from day to day, and even minute to minute, and the alleged case of impossibility is only one of like kind.

But to the clergyman with the inquiring mind I would answer as follows:—

1. What I *did* write, in the summer of 1877, on the future weather is to be found at p. "25" of vol. xiv. of the "Edinburgh Astronomical Observations," a volume so liberally distributed by H.M. Government to scientific societies and libraries in London that no one there need have any difficulty in referring to my exact words if they are thought of consequence by any body.

2. Those words are, at all events, as to their general scope and bearing, widely different from the newspaper cutting alluded to. For while that treats only of a cold winter, my first and leading contention in the book was not about cold at all, but about heat. Namely, that the Edinburgh earth-temperature measures for forty years past show that a great *heat-wave* comes upon the earth from without, presumably from the sun, every eleven years, nearly; and that the date of the next such *heat-wave* was "1879.5, within limits of half a year each way." According to which the coming summer and autumn of this year may prove glowingly hot, and next winter unusually mild, in obedience to a grand cosmical action upon the earth as a whole. And who has yet disproved that?

3. My second, but only second and inferior, contention was, that such eleven-year *heat-wave*, of solar origination—contrary

to the usual ideas of the learned as to the crest of a wave being removed from its trough or lowest point by about half of its length—was, in this case, both *immediately* preceded and *immediately* followed by a trough of extreme cold; the extremest cold, or lowest trough of each whole eleven years period on either side of the *heat-wave's* crest. Wherefore I contended (in 1877) that we had then still, between us and the good, warm time coming, a trough of extreme cold to wade through; and I did say that that preliminary cold-wave might be expected about 1878.0 "within limits of three-quarters of a year."

4. Because the winter of 1877-78 was not cold, and the winter of 1878-79 is now very cold, in *Great Britain*, the clergyman holds that my prediction was totally falsified. But to that conclusion I oppose the following consideration:—Is the surface of Great Britain large enough to be taken as expressing the condition of the whole globe under a cosmical influence from space without? Is not China much larger than the so-called Great Britain, and was not last winter preternaturally cold in China, with snow and ice down to the sea-coast even in lat. 29°, and inland such long-continued frosts and dry weather, that thence no crops, and the dreadful famine with depopulation of whole provinces?

Is not also the surface of North America larger than that of Great Britain; and at a central station of the former, Manitoba (as worthily reported and notified by Prof. E. D. Archibald in NATURE, vol. xix, p. 266) was not the December of the present winter astonishingly warm, almost hot, or no less than 25° above the mean temperature of former Decembers there?

5. Hence, if we look beyond our own immediate coasts, I suspect that the deficiency of radiation from the sun, called the cold trough, may have occurred, in reality, not far from the date I suggested in 1877, viz., in 1878.0. But as such influence from without has to act on the solid earth practically through the medium of an absorptive, locomotive, double revolving atmosphere, its full and extremest effects are experienced in different manners and at different dates in different parts of the earth.

Wherefore the "meteor" then becomes an affair for terrestrial meteorologists, not for astronomers, to follow up and explain; though the former may glean some useful hints from what the latter have long since ascertained as to the lunar tide-wave: viz., that it is raised, or coincides most nearly with a meridian full moon, near the middle of the Pacific; but at far different and later dates at other places, according to the length and difficulty of the path by which the tide-wave, once raised, has to travel to reach them.

PIAZZI SMYTH

15, Royal Terrace, Edinburgh, February 1

Sun-Spots and the Plague

Apropos of the plague—I do not know whether the following curious coincidence has been noticed. In that admirable work, John Graunt's "Natural and Political Observations upon the Bills of Mortality" (second edition, London, 1662), which is probably the earliest treatise on vital statistics, I find the following statement (p. 31):—"There have been in London, within this age, four times of great mortality, that is to say, the years 1592 and 1593, 1603, 1625, and 1636." He shows that large numbers died of the plague in each of these years. Now, if we take the solar period to be 10½ years, nearly in accordance with Dr. Lamont's and Mr. J. A. Broun's estimates, we get the subjoined table, which sufficiently explains itself.

Corresponding solar years.	1592.5	...	Plague in London	...	...	1592-3.
	1603	...	"	...	...	1603.
	1613.5	...	"	...	...	...
	1624	...	"	...	...	1625.
	1634.5	...	"	...	...	1636.
	1645	...	...	...	...	...
	1655.5	...	Great Plague in Naples	...	...	1656.
	1666	...	" of London	...	...	1665.
	...	...	...	...	...	...
	1718.5	...	" at Marseilles	...	...	1720.

If this particular coincidence has not already been pointed out, it deserves notice as supporting the theory that the rate of mortality is remotely connected with the solar period. There may be several chains of causation leading to the increase of mortality, but one chain is doubtless through the Asiatic famines, which would naturally develop the worst forms of germ disease.

W. STANLEY JEVONS